

TOOLBASESM TECHSPECS

Precast Concrete Panels

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TECH @ A GLANCE

BENEFITS (+) / DRAWBACKS (-)

- + **AFFORDABILITY:** Reduced labor costs due to quicker/easier assembly, in some cases no mason is required
- + **QUALITY/DURABILITY:** Tornado/hurricane damage resistance; fire, termite, and dry-rot resistance
- + **ENERGY EFFICIENCY:** Requires less insulation
- + **MARKETABILITY:** Low maintenance and improved sound-proofing
- + **SCHEDULING:** Panels cure in the factory, and can be erected in cold temperatures, preventing concrete pour delays
- **AFFORDABILITY:** Higher up-front cost; requires on-site crane; may require certified installer

INITIAL COST

Precast concrete systems generally cost between \$55 and \$65 per linear foot of wall, making them competitive with other foundation walls. Rapid assembly and erection can significantly reduce labor costs. For most projects, a concrete footing is not required, which can reduce on-site material and labor costs. However, panel erection requires a crane which will have added cost, but that cost may be offset by labor and time savings.

OPERATIONAL COST

An insulated precast concrete system can reduce energy bills throughout its expected life.

CODE ACCEPTANCE

Sections R401 through R406 of the 2003 International Residential Code outline requirements for foundations including materials, footings, foundation walls drainage, and waterproofing. According to section R 402.3, precast panels must be designed and installed

according to the provisions of the code and the manufacturer's installation instructions.

RESULTS FROM THE FIELD

Field evaluations have demonstrated that precast concrete foundations can be installed quickly and easily, and can offer significant labor savings.

WARRANTY

Warranties vary by manufacturer.

MAKING THE SWITCH

Precast concrete panels are prefabricated in a factory, and are easier to assemble on site than poured concrete or masonry. Erection time is greatly reduced. Connections, bracing, reinforcement, and openings need to be designed and detailed before fabrication.



THE BASICS

Precast concrete foundation walls are panels that are cast and cured in a controlled factory environment, which helps ensure panel quality and uniformity.

Panels can be installed in a fraction of the time that poured concrete foundations and traditional exterior walls would take. When panels are delivered to the site, they are often erected in three or four hours. Because the concrete is cured in the factory, foundations can be backfilled as soon as the slab and first-floor are braced. The factory fabrication process reduces or eliminates weather delays.

Panels are cast as solid reinforced precast concrete (flat panels), or as reinforced concrete ribbed panels with a thin exterior shell. Some manufacturers cast the concrete against foam insulation as a form, which provides additional insulation (higher R-value) for the structure. Concrete panels can be designed with a strength of 5,000 psi. This results in panels that are stronger than concrete block or most poured concrete walls, but are thinner and lighter weight. Walls may be customized during the order process to allow for door and window openings, steel beam pockets, and brick ledges.

Although precast concrete panels can be installed rapidly, installers who are not familiar with prefabricated panel assembly will need additional training. In fact, some manufacturers only allow certified installers to deliver and erect their systems.

DOLLARS AND SENSE

Precast concrete systems generally **cost between \$55 and \$65 per linear foot of wall**, making them competitive with other foundation walls. Installation times can be extremely short. For the PATH MADE Home, the crushed stone bed took two hours to prepare, and the panels were set in three hours.

Although precast concrete panels can be installed rapidly, installers who are not familiar with prefabricated panel assembly will need additional training. In fact, **some manufacturers only allow certified installers to deliver and erect their systems, which could add to the cost.** Use of precast panels should be submitted for building code approval with the building permit application, which may be an additional cost over conventional construction during the design phase.

MAKING THE SWITCH

What is required to transition from your current building practices to using this technology?

Check Local Codes – Consult local code provisions affecting precast concrete panels.

Select a Precast System – Consider location, delivery options, whether certified installers are required, and system options when making the choice. Wall panels can be produced in numerous colors and finishes, which allow a broad range of aesthetic options.

Review Home Designs – Check standard home plans for suitability for precast panels. Remember, wall panels must generally be customized to allow for window and door openings. Most wall panels feature embedded connection hardware so they can more easily be connected into a complete framing assembly.

Train Installers - Installers must be trained in precast concrete panel assembly. Some manufacturers may require assembly by their own certified installers. Review the manufacturer's guidelines for installation and backfilling and prepare for any additional requirements outlined by local codes, such as extra waterproofing.

Work With Your Trade Contractors – Advise framers of connection details to framing, electricians and plumbers of routing considerations, masons of poured flooring, and drywallers of any pre-attached furring strips.

Tools – A crane is required for erection, along with wrenches to bolt connections.

RESULTS FROM THE FIELD

This technology has been used by other builders in real-world building situations – learn from their experiences.

Bowie, Maryland, MADE Homes (PATH Field Evaluation)

- MADE (Marketable, Affordable, Durable, Entry-level) Homes Project recorded builder's experience constructing four 1,800 square foot detached single-family homes
- Two homes used precast concrete foundation panels by Superior Walls®
- Builder found panels to be cost-competitive with formed/poured concrete walls and block foundations; panel manufacturer used its own installers to construct the foundation
- Precast panels are water-resistant and did not require additional waterproofing; however, local codes required additional protection, which was provided with an acrylic spray-applied coating, in lieu of traditional asphalt based coatings
- Preparation of 6-inch crushed stone base took about two hours; setting precast foundation walls took less than three hours
- First panel set in place and braced with 2x4s; second panel placed to form a corner
- Panels were connected at the top and bottom with 5/8-inch bolts, inserted through steel plates cast into the wall at factory
- After one corner was set, no further bracing was required



Dover, Delaware, Rolling Meadows Subdivision, Dunrite Construction, Inc. (PATH Case Study)

- Dunrite Construction, Inc. built 13 detached single-family homes in a 40-lot subdivision
- For home designs with basements, builder found precast concrete foundation panels were cost effective and faster to install than block foundations
- Superior Walls® precast foundation panels provided to Dunrite by Weaver Precast, Inc. of Ephrata, PA
- Panels were pre-manufactured in a variety of standard heights, and lengths up to 16 feet; constructed using 2x8 fiber- and steel-reinforced concrete studs with polystyrene insulation and 2-inch concrete shell
- Structural design provided sufficient load-bearing capacity at less than 1/3 the weight of a typical 10-inch thick concrete wall, allowing panels to be placed on bed of gravel, rather than concrete footings
- Manufacturer estimated most builders can save 15 percent over traditional basement foundation construction

FOOD FOR THOUGHT

This section provides some things to think about before switching to this building technology – make sure it's the right choice for you.

Although precast concrete panels offer speedy installation, many manufacturers require panel assembly by their own certified installers.

Panels require a crane for placement.



The stone sub-base must be compacted and leveled to provide an even surface for panel erection, and later floor joist installation.

Configurations may be customized during the order process to allow for door and window openings, steel beam pockets, and brick ledges to be cast into the panels. This requires additional initial effort during the planning stage.

Use of precast panels should be submitted for building code approval with the building permit application.

For retrofits, significant excavation may not be feasible in affected foundation wall areas with limited access.



DEFINITIONS

Prefabrication

Manufacturing of structural components off site provides a factory-controlled environment. Prefabricated panels are not exposed to weather conditions during fabrication, and are delivered to the job site ready to be assembled.

PSI (pounds per square inch)

Poured concrete walls usually have a design strength of 3,500 psi, whereas precast concrete foundation panels can have a design strength of 5,000 psi.

TECH CHECK

This checklist outlines the steps to follow if you decide to implement this technology in your next building project.



- Planning.** The manufacturer will require details about soil conditions, the excavation and the structure's design, and must receive approved drawings before production can begin.
- Code Acceptance.** Designs that use precast walls should be submitted for pre-approval with other architectural details with the building permit application. Precast concrete manufacturers generally provide engineering and energy performance documentation to builders to facilitate their acceptance by local building departments
- Arrange crane access.** Make necessary arrangements for a crane and crane access to the site.
- Prepare foundation base.** The site is excavated, and a six to 12-inch gravel bed is prepared over drain pipe, for bearing and drainage. Make sure that gravel base is level to provide an even surface for the floor joist installation. No conventional poured footer is necessary for many residential applications.
- Place and assemble panels.** A crane is used for lifting and placing precast concrete panels, which are then sealed and bolted together. Apply a waterproofing material if required by code or desired.
- Pour slab and install floor system.** Once panels are assembled, pour the basement slab. Floor joists are installed above the foundation to provide bracing before backfilling foundation walls.
- Backfill.** Once braced by the slab and floor system, the foundation can be backfilled. Manufacturers provide guidelines for bracing and backfilling.



The Partnership for Advancing Technology in Housing (PATH) is dedicated to accelerating the development and use of technologies that radically improve the quality, durability, energy efficiency, and affordability of America's housing. Managed by HUD, the PATH partnership includes the homebuilding, manufacturing, insurance and financial industries, and Federal agencies concerned with housing.

PATH addresses barriers to innovation, provides information on advanced building technologies, and advances housing technology research; making affordable, quality American homes a reality.

For more information on the PATH program, visit www.pathnet.org.

Tech Specs are Prepared for PATH by the NAHB Research Center.

RESOURCES

ToolBase Services

Information on this building technology and many others brought to you by PATH and the building scientists at the NAHB Research Center.
www.toolbase.org

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